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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: FAX OVER INTERNET			
(57) Abstract			
<p>A facsimile communication system is provided which has a new level of automation, compatibility with IP networks and usability. When run from a platform with fax/modems with voice capability and an Internet connection, it provides an integrated solution for fax-to-fax transmission over the Internet. The subscriber does not require new equipment, Internet connection, software, or training in order to use this new service.</p>			
<pre> graph TD     CALLERFAX --&gt; PSTN     PSTN --- FAXMODEM1["FAX MODEM #1"]     PSTN --- FAXMODEM2["FAX MODEM #2"]     FAXMODEM1 --- DATAFILESENDER["DATA FILE SENDER"]     FAXMODEM2 --- DATAFILESENDER     DATAFILESENDER --- LOGSTORE["LOG STORE"]     LOGSTORE --- LOGREPORTER["LOG REPORTER"]     LOGREPORTER --- TRANSMISSIONREPORTER["TRANSMISSION REPORTER"]     TRANSMISSIONREPORTER --- ACCOUNTAUTHORIZATION["ACCOUNT AUTHORIZATION"]     ACCOUNTAUTHORIZATION --- DESTINATIIONNUMBERDETECTOR["DESTINATION NUMBER DETECTOR"]     DESTINATIIONNUMBERDETECTOR --- FAXSTORAGE["FAX STORAGE"]     FAXSTORAGE --- REMOTESERVER["REMOTE SERVER"]     REMOTESERVER --- REMOTEFAXMODEM1["REMOTE FAX MODEM #1"]     REMOTEFAXMODEM1 --- DESTINATIONFAXMACHINE["DESTINATION FAX MACHINE"]     DESTINATIONFAXMACHINE --- PSTN     REMOTESERVER --- REMOTEFAXMODEM2["REMOTE FAX MODEM #2"]     REMOTEFAXMODEM2 --- DATAFILESENDER     REMOTEFAXMODEM2 --- LOGSTORE     REMOTEFAXMODEM2 --- LOGREPORTER     REMOTEFAXMODEM2 --- TRANSMISSIONREPORTER     REMOTEFAXMODEM2 --- ACCOUNTAUTHORIZATION     REMOTEFAXMODEM2 --- DESTINATIIONNUMBERDETECTOR     REMOTEFAXMODEM2 --- FAXSTORAGE     REMOTEFAXMODEM2 --- REMOTESERVER     REMOTESERVER --- REMOTEFAXMODEM1     REMOTESERVER --- REMOTEFAXMODEM2     REMOTESERVER --- DESTINATIONFAXMACHINE     REMOTESERVER --- PSTN   </pre>			

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### FAX OVER INTERNET

The present application claims priority of U.S. Provisional patent application serial no. 60/036,814  
5 filed February 3, 1997.

#### Field of the Invention

The present invention relates to a facsimile communication system of the type in which a sending 10 facsimile machine transmits to a local server which, in turn, sends the facsimile transmission data via a data network to a remote server at a destination, which in turn transmits the facsimile data to a destination facsimile machine.

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#### Related Prior Art

A known prior art system is disclosed in U.S. Patent 4,905,273 to Gordon et al., published in 1990. This patent discloses a discrete device which is placed 20 between a facsimile machine and a public switched telephone network (PSTN), which transmits the calls to a long distance receiver. This differs substantially from the invention of the present application, which is directed to an entire system linking a caller fax machine 25 to a destination fax machine. The invention of this application further distinguishes from the prior art reference to Gordon et al. in that it includes feedback for account authorization and transmission.

#### 30 Summary of the Invention

It is an object of the present invention to provide a facsimile communication system which facilitates ease of connection of a user's facsimile machine to the system. It is a further object of the present invention 35 to provide a facsimile communications system which provides improved reporting of facsimile transmissions to the user.

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According to a first broad aspect of the present invention, there is provided a facsimile communication system comprising a facsimile communications system comprising: at least one fax modem means including DTMF decoding means; account authorization means connected to the fax modem means for identifying a caller and authorizing receipt and forward of a facsimile transmission; means connected to the DTMF decoding means for obtaining a desired destination facsimile number from the caller; means connected to the fax modem means for storing a facsimile transmission sent by the caller, along with the desired destination facsimile number; and data network communications means for sending a data file containing the stored facsimile transmission and the number over a data network.

Preferably, the system further comprises means connected to the data network communications means for receiving a transmission report from a remote server means located near to the desired destination facsimile number and connected to the data network for receiving the data file; and means for communicating to the caller at least a failure of the stored facsimile transmission from successfully being transmitted to the destination number.

Also preferably, the system further comprises a remote server means located near to the desired destination facsimile number and connected to the data network for receiving the data file; and remote facsimile transmission means for connecting to the desired destination facsimile number over a telecommunications network, and for transmitting the stored facsimile transmission to a facsimile machine at the desired destination facsimile number.

Further preferred features of the present invention are set out in the appended claims.

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#### Brief Description of the Drawings

The invention will be better understood by way of the following detailed description of a preferred embodiment with reference to the appended drawings in which:

Figure 1 is a schematic block diagram of the facsimile communication system according to the preferred embodiment;

Figure 2 is a schematic process diagram of the preferred embodiment; and

Figure 3 is a flow diagram of the steps according to the method of the preferred embodiment.

#### Detailed Description of the Preferred Embodiment

As shown in Figure 1, the facsimile communication system has a plurality of fax modems connected to a first local telephone network to which a caller fax machine and a caller telephone can connect. The fax modems in the preferred embodiment are Hayes Optima external modems (Model 08-02752) which include DTMF decoding capability, voice generation capability and Caller ID data communication ability. The account authorization means, which is part of the "VGetty" process, receives the Caller ID data from one of the fax modems and looks up in a client database whether this telephone number corresponds to that of an existing customer's telephone number and answers the call. The account authorization means sends the appropriate data to the fax modem to generate a suitable voice greeting welcoming the caller. If the telephone number corresponds to the telephone number of an existing client, the caller is then prompted to enter an authorization code similar to a PIN.

The account authorization means then receive the DTMF codes decoded by the appropriate fax modem and confirms that the code is correct. If the code given is incorrect, then a voice prompt to re-enter the correct code is given until a maximum number of tries has been

exhausted after which the fax modem is signaled to hang up and the account authorization means records in the client database that further attempts to use the customer's account are to be frozen until an operator 5 confirms the correct authorization code with the customer. Once the correct code has been given and the account authorization means authorize the receipt and forward of a facsimile transmission from the caller, the account authorization means sends to the fax modem the 10 data required to generate a voice prompt requesting the caller to enter the destination telephone number.

The destination number detector is signaled by the account authorization means to record the subsequent 15 telephone number detected by the DTMF decoding means in the fax modem. If the destination number can be determined to be an invalid number, then the destination number detector sends the appropriate data for a voice prompt informing the caller that the number dialed is incorrect and prompts the caller to redial the number. 20 Upon receipt of a complete destination number, the destination number detector sends the appropriate data to the fax modem to prompt the user to send the fax.

The facsimile transmission is stored by the fax storage unit and when complete, the fax storage unit 25 signals the data file sender to prepare a data file containing the desired destination facsimile number, the facsimile data file (preferably in TIFF format) along with a job ID identifying the transmission. The data file sender then determines which remote server is best 30 located to handle re transmission of the facsimile transmission. The data file is then sent through the data network (for example the INTERNET) to the remote server.

The remote server stores the data file received and 35 commands one of its fax modems to place a local or intermediate distance long distance telephone call over a telephone network near to the destination fax machine so

that the facsimile image can be sent from the remote server to the destination fax machine.

A remote transmission reporter creates a transmission report from the information concerning the events taking place, and the transmission report is sent from the remote server through the data network back to the originating data file sender which then stores the transmission report in a log storer. If the transmission report indicates a failure, the transmission reporter local to the caller generates a facsimile transmission report page and sends it over one of the fax modems and the local PSTN to the caller's facsimile machine. If the transmission was a success, then a log reporter includes the transmission result in a daily log which is sent on a daily basis to the caller's fax machine. At the stage of account authorization, a caller may press a code indicating a request for an immediate log of all facsimile transmissions and the log reporter may be prompted to prepare and transmit an interim log report to the caller's fax machine.

As can be appreciated, the local server system can be provided by the appropriate software in a general purpose computer. In the preferred embodiment, the software which receives and sends the fax information is "HylaFax" software which is shareware software available from the Internet at "<http://www.vix.com/flexfax/>".

Local IFX servers are installed on the Internet at points of presence to form a global network. Each IFX server provides service in its own defined local area. The routing over the Internet between the IFX servers is controlled from a central location which is constantly updated. The central location also handles the accounting, billing, administration, management and revenue sharing between the Service Points. Subscribers to the service do not need any special equipment or software to use the service and take advantage of the cost savings.

The steps carried out according to the preferred embodiment are illustrated in Figure 3.

**Example**

5      A customer or subscriber in Bombay (sender) wants to send a fax to Tokyo (recipient). The user calls (accesses) from his fax machine the Bombay IFX server, is automatically identified, dials the number of the recipient in Tokyo and starts the fax. The Bombay IFX  
 10     server accepts the message, forwards it to the Tokyo IFX server. The Tokyo IFX server delivers the fax by dialing the fax designated by the local Tokyo number. In the event of a delivery problem the sender will receive  
 15     notification thereof. Long distance charges are eliminated since calls are local at both sending and receiving ends. The service can therefore be offered to the user at a much lower cost. The recipient need not be a subscriber. The recipient can be a fax or any equipment  
 20     that operates like a fax e.g. computer with fax capability.

The following table illustrates the process.

State	Entity/Process	Action	Program code	Benefits
1	Subscriber	Sends in fax		
2	"VGetty" Process (not part of Hylafax)	Welcomes subscriber	Use of Caller ID to verify if user is authorized for service Generates Interactive Customized Voice prompts Employs DTMF decoding to identify fax # of destination	Eliminates the need for subscriber to enter authorization code. Subscriber needs only to follow the voice prompt Subscriber keeps using preferred method of dialing the destination #.
3	Local Hylafax Server	Receives fax		

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4	"Rcvd" Process	Combines and transmits information to Local Hylafax Client.	gets destination phone # from "Vgetty" gets info on received fax : Job ID, rate, format, filename decides to which Remote Hylafax Server to send the fax job	Forwarding and follow-up of fax transmission over the Internet becomes reliable and easy.
5	Local Hylafax Client	Transmits fax over IP Network to remote Hylafax Server		
6	Remote "Hylafax Server"	Receives fax information		
7	Remote "Hylafax Server"	Delivers fax to destination #		
8	Remote "Hylafax Server"	Sends email to "Notify2log" process on local fax server		
9	End customer	Receives his fax		
10	"Notify2log" process on local fax server	Terminates the fax transmission	receives & analyses email updates "account.log" faxes notification to sender in event of problem with delivery	follow-up of fax transmission forwarding over Internet and final delivery becomes automated. generates a basis for accounting and billing database automation of subscriber notification of delivery

**VGETTY Process Description**

The process is invoked by the local HylaFax fax

5 server with two arguments :

- Device ID
- Caller ID

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The VGETTY process first checks the second argument, the Caller ID, on a list of authorized phone numbers.

5 If a match is not found, VGETTY plays a voice message asking for a fax number to send info on the service. The number consequently entered by the user is captured by the process using DTMF decoding. After a thank you voice message, the process hangs up. If the 10 captured number is valid, information on how to join the Service is forwarded to the user by fax.

If, on the other hand, the Caller ID is authorized, a different voice message is played asking the subscriber to enter the destination fax number. Any time during or 15 after the voice message, the process can capture the destination fax number using DTMF decoding. The captured number is stored in a file which is retrieved later by the RCVD process.

Once captured the fax number is converted to the 20 canonical form : +<country code><local part>

A subprocess, CANONIZE, is then started to determine to which remote server the incoming fax should be forwarded. This subprocess can return one of the following three results.

- 25 • The remote server can be determined, and the destination number is stored in a file.  
• If the destination cannot be reached because the destination is not within our service area, A voice message indicating that the location cannot be reached 30 is played and the call is terminated.  
• The last case is when the captured phone number has an invalid format, and the call is terminated.  
When terminated, the process returns control to the local HylaFax fax server.

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#### RCVD Process Description

RCVD is a customized process that runs on the fax server computer. It is invoked by the fax server after a fax has been received and stored in a queue, in the TIFF format. A list of arguments are passed to this process including,

- the file name of the TIFF fax file
- duration time of receiving the fax
- protocol
- connection rate
- error message
- device
- TSI (transmitter subscriber identification)
- caller ID

After all the above information is organized, four more pieces of information are processed,

- the destination number is retrieved from a file stored by VGETTY and converted to the canonical format "+<countrycode><local part>" by the subprocess

#### 20 CANONICAL

- the number of fax pages received is determined by examining the TIFF file using the FAXINFO subprocess.
- and thirdly, the sender's phone number is also be converted into canonical form.

25. The RCVD process then invokes the ROUTE subprocess to determine the name of the destination fax server. ROUTE processes the destination number by looking up the HOST2PHONE mapping table and returns with one of the following results :

- 30 • no host can be mapped to the destination number - an error is returned.
- destination number is invalid - an error is returned.
- a mapping is found - the remote server is returned.

The last step of this process is to direct a fax client process to transmit the fax to the predetermined server and terminating with creating a log entry containing the information including the job ID,

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destination server, date and time, caller ID, TSI, duration time of receiving the fax, number of pages in the fax document, the destination number, and the status SND which is updated later by the NOTIFY2LOG process 5 after the outgoing fax job has been delivered to the fax machine at the final destination.

#### NOTIFY2LOG Process Description

NOTIFY2LOG is invoked when an email has been 10 received by the local fax server from the remote fax server. This email contains three piece of important information required to determine the final status of an outgoing fax job, i.e. at the delivery

- 15 • Job Identification Number,
- Name of the remote server that processes the outgoing job,
- Status of the delivery of the fax.

NOTIFY2LOG analyzes the email using the subprocess SETSTAT to parse and extract information contained in the 20 email. One of the following three results is reported after the email is analyzed,

- the email contains no job ID - the email is discarded and NOTIFY2LOG terminates.
- 25 • a parsing error occurs (email format not recognized), the email is discarded and NOTIFY2LOG terminates.
- all three pieces of information are successfully extracted from the email and SETSTAT proceeds to find an entry in the log that matching the job ID and server name. The status field of the entry is updated to the 30 status extracted from the email.

In the last case, the updated status can be,

- OK - fax delivered to destination successfully
- ERR - general error occurred
- BSY - the line was busy. Tried but did not get through
- 35 • NAW - no answer to that number
- NCR - no carrier. May be a voice number.

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Any status other than "OK" invokes the subprocess FAXRESULT to return to the sender a fax with the reason why the fax could not be delivered.

## **CLAIMS**

1. A facsimile communications system comprising:
    - at least one fax modem means including DTMF decoding means;
    - account authorization means connected to said fax modem means for identifying a caller and authorizing receipt and forward of a facsimile transmission;
    - means connected to said DTMF decoding means for obtaining a desired destination facsimile number from said caller;
    - means connected to said fax modem means for storing a facsimile transmission sent by said caller, along with said desired destination facsimile number; and
    - data network communications means for sending a data file containing said stored facsimile transmission and said number over a data network.
  2. The system as claimed in claim 1, further comprising:
    - means connected to said data network communications means for receiving a transmission report from a remote server means located near to said desired destination facsimile number and connected to said data network for receiving said data file; and
    - means for communicating to said caller at least a failure of said stored facsimile transmission from successfully being transmitted to said destination number.
  3. The system as claimed in claim 1, further comprising:
    - a remote server means located near to said desired destination facsimile number and connected to said data network for receiving said data file; and
    - remote facsimile transmission means for connecting to said desired destination facsimile number over a

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telecommunications network, and for transmitting said stored facsimile transmission to a facsimile machine at said desired destination facsimile number.

4. The system as claimed in claim 3, further comprising:

means connected to said data network communications means for receiving a transmission report from said remote server means; and

means for communicating to said caller a transmission status of said stored facsimile transmission transmitted to said destination number.

5. The system as claimed in claim 1, wherein said fax modem means include caller ID means, and said account authorization means use a telephone number of said caller received from said caller ID means to identify said caller.

6. The system as claimed in claim 1, wherein said authorization means include a database containing an authorization code for each customer and authorize said receipt and forward upon receipt of a code from said caller matching said authorization code from said database for said caller.

7. The system as claimed in claim 5, wherein said authorization means include a database containing an authorization code for each customer and authorize said receipt and forward upon receipt of a code from said caller matching said authorization code from said database for said caller.

8. The system as claimed in claim 7, wherein said authorization means include voice prompt generating means for prompting said caller to enter said code.

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9. The system as claimed in claim 8, wherein authorization means are connected to said DTMF decoding means, and said code is entered by DTMF signals.

10. The system as claimed in claim 5, wherein said authorization means include:

voice prompt generating means for prompting said caller to enter a response facsimile number if said telephone number of said caller is not recognized as a telephone number of an existing customer; and

means for sending to said response facsimile number sales information.

11. The system as claimed in claim 2, wherein said means for communicating to said caller are connected to said fax modem means, dial a facsimile number of said caller, and send a client transmission report to said caller at said facsimile number of said caller.

12. The system as claimed in claim 2, further comprising log report request receipt means for receiving a request for a log report from said caller once authorized by said authorizing means, wherein said means for communicating to said caller further comprise log report means for transmitting a status report of all facsimile transmissions made by said caller over a predetermined time period.

13. The system as claimed in claim 11, further comprising log report request receipt means for receiving a request for a log report from said caller once authorized by said authorizing means, wherein said means for communicating to said caller further comprise log report means for transmitting a status report of all facsimile transmissions made by said caller over a predetermined time period.

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14. The system as claimed in claim 2, wherein said data file includes a job ID code, said transmission report includes said job ID code, and said means for communicating to said caller includes means for using said job ID code to access a database of facsimile jobs to obtain information on said caller and said desired destination facsimile number.

15. The system as claimed in claim 4, wherein said data file includes a job ID code, said transmission report includes said job ID code, and said means for communicating to said caller includes means for using said job ID code to access a database of facsimile jobs to obtain information on said caller and said desired destination facsimile number.

16. The system as claimed in claim 3, further comprising priority selection means for selecting a priority of said facsimile transmission authorized, said data network communications means and said remote facsimile transmission means being responsive to said priority to control a priority of transmission of said data file and of said transmission of said stored facsimile transmission.

17. The system as claimed in claim 16, wherein said priority is selected by said caller, and a service charge for said facsimile transmission is set in accordance with said priority selected.

18. A facsimile communications system comprising:  
a server means located near a desired destination facsimile number and connected to a data network for receiving from a remote server a data file containing a stored facsimile transmission and said number;  
a facsimile transmission means for connecting to said desired destination facsimile number over a local

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telecommunications network, and for transmitting said stored facsimile transmission to a facsimile machine at said desired destination facsimile number; and

a transmission report generator connected to said facsimile transmission means and said data network for sending a transmission report to said remote server.

19. A method of routing a data transmission from a caller receiver/transmitter to a remote receiver/transmitter comprising the steps of:

i) dialing at least one local modem through a public switched telephone network;

ii) transmitting caller identification information associated with said caller receiver/transmitter and remote identification information associated with said remote receiver/transmitter to a data base means;

iii) transmitting a status signal from said database means to either authorize or decline a transmission from said caller receiver/transmitter.

20. The method of routing a data transmission of claim 19, including the step of sending a prompt signal to said caller receiver /transmitter to prompt a caller to send data when said status signal indicates authorization of said transmission.

21. The method of routing a data transmission of claim 19, including the step of sending a prompt signal to said caller receiver transmitter to refrain a caller from sending data when said status signal indicates a decline of the transmission.

22. The method of routing a data transmission of claim 20, including the step of sending a data transmission from said caller receiver/transmitter to a data storage means via said modem.

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23. The method of routing a data transmission of claim 21, including the steps of:

- a) sending a data transmission from said data storage means to a data sending means, and
- b) transmitting said data transmission through a data network to a remote server.

24. The method of routing a data transmission of claim 22, including the step of dialing a remote receiver/transmitter and transmitting said data transmission to said remote receiver/transmitter.

25. The method of routing a data transmission of claim 22, wherein said remote server communicates with a remote reporting system.

26. The method of routing a data transmission of claim 24, including the step of transmitting a reporting signal from said remote reporting system to said remote server and routing said reporting signal through said data network to said caller receiver/transmitter to report the results of said data transmission to said remote receiver transmitter.

27. The method of routing a data transmission of claim 23, wherein said remote server communicates with a remote modem.

28. The method of routing a data transmission of claim 26, further comprising the steps of:

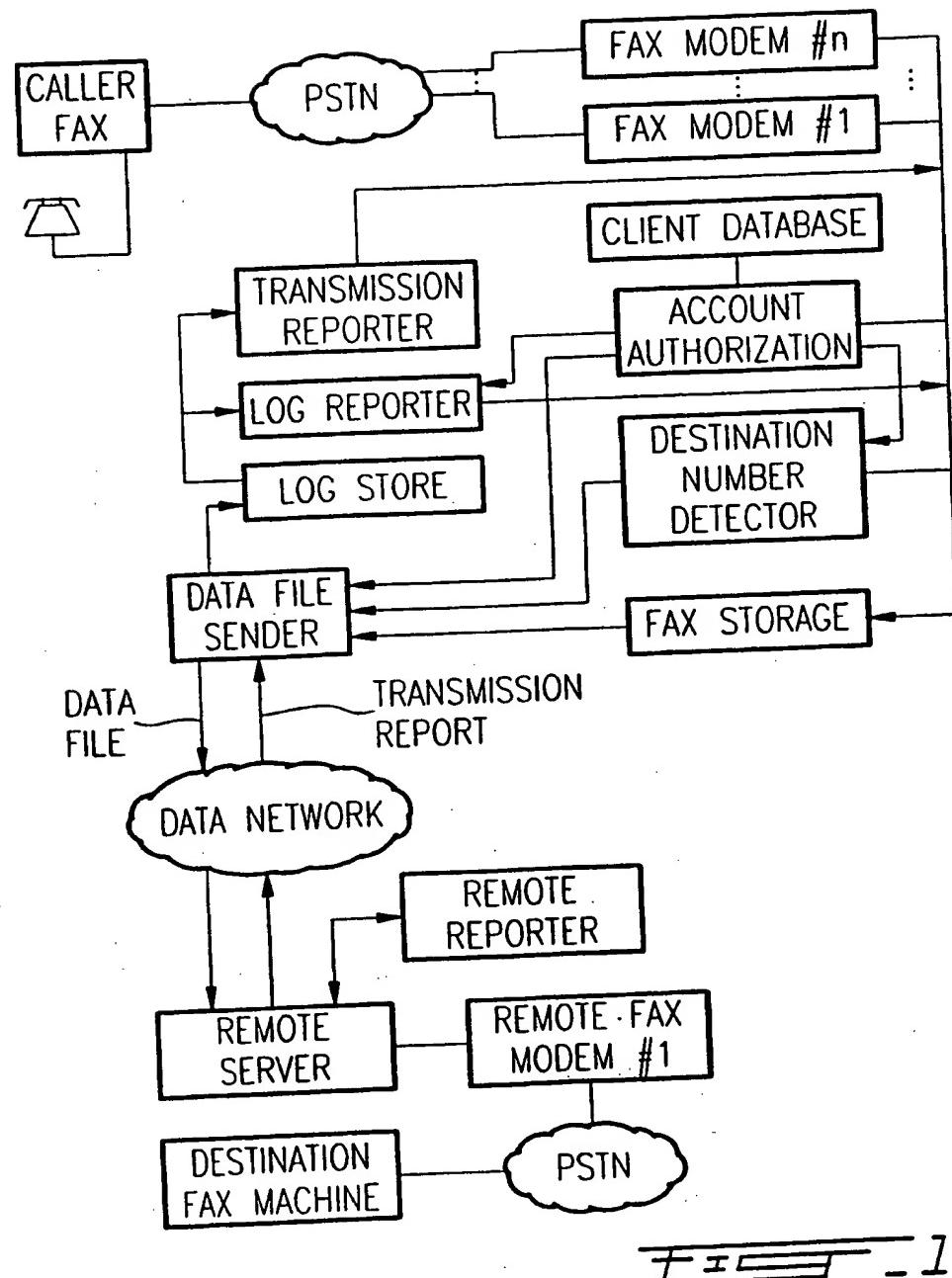
- a) sending a data transmission from said remote server to said remote modem, and
- b) further transmitting said data transmission to a public switched telephone network and on to said remote receiver/transmitter.

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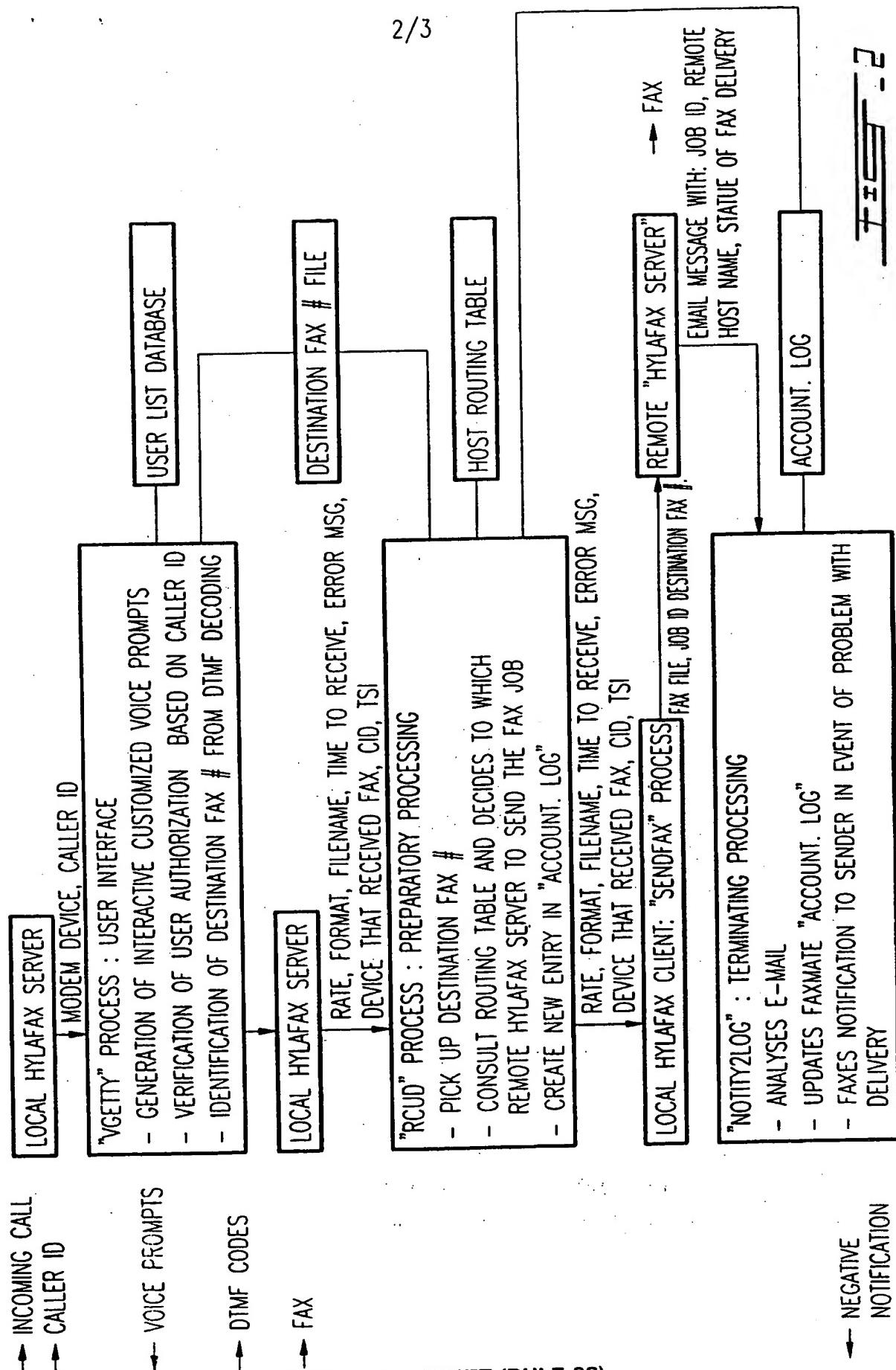
29. The method of routing a data transmission of claim 22, wherein said data network is the Internet.

30. The method of routing a data transmission of claim 22, wherein said data network is a local area network.

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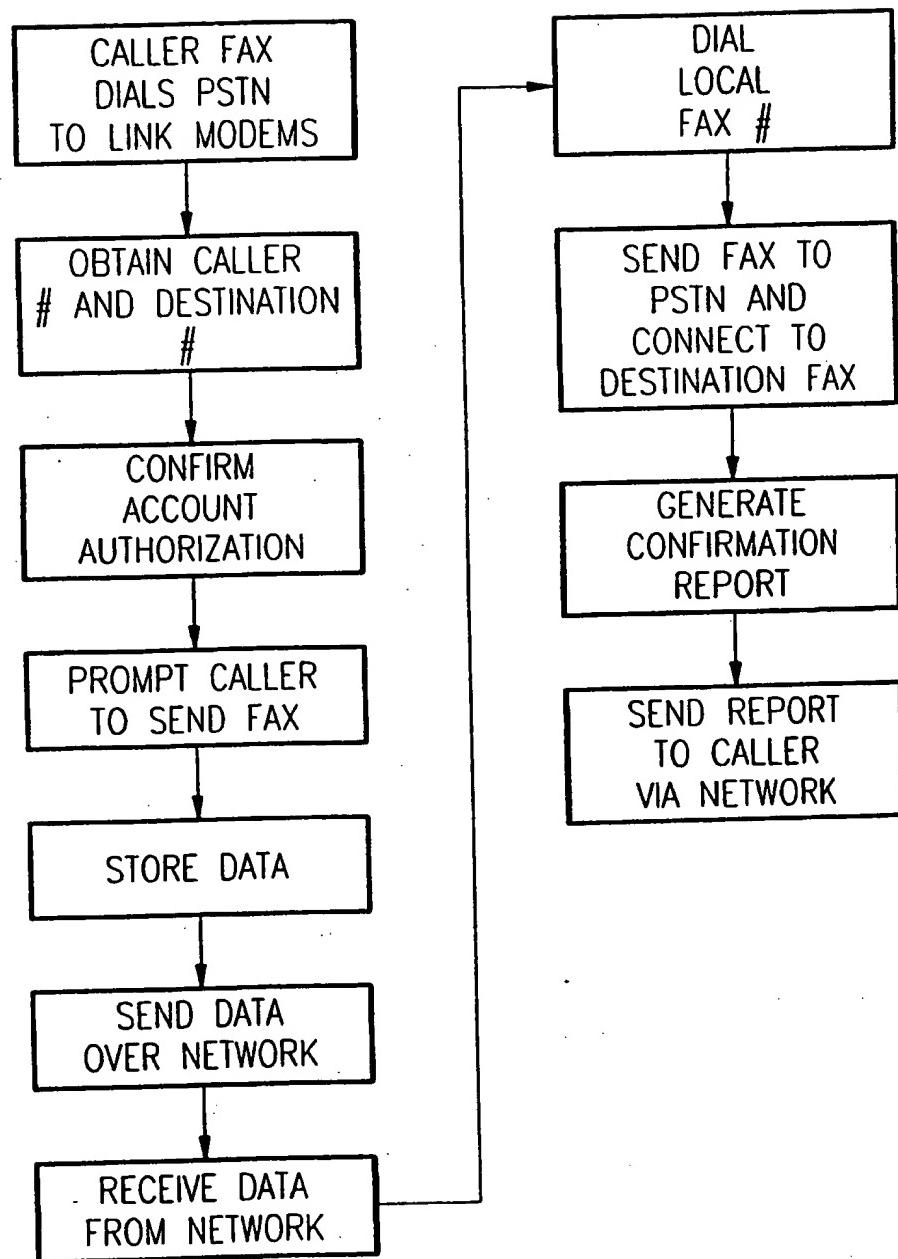


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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/CA 98/00128

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 H04N1/32

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 H04N G06F H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 96 41463 A (GESHWIND DAVID M) 19 December 1996	1,18,19
A	see the whole document	2-17, 20-30
---		
Y	WO 96 20553 A (ALPHANET TELECOM INC) 4 July 1996	1,18,19
A	see the whole document	2-17, 20-29
---		
A	WO 96 34341 A (BOBO CHARLES II) 31 October 1996	1-30
	see page 13, line 27 - page 41, line 6	
---		
A	EP 0 747 845 A (IBM) 11 December 1996	1-30
	see abstract	
---		
	-/-	



Further documents are listed in the continuation of box C.



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Date of the actual completion of the international search

16 April 1998

Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

Internal Application No

PCT/CA 98/00128

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Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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